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Title: Production of Foamed Decorative Material

Application Number: Application Number Sho 62 (1987) 267711

Filing Date: October 23, 1987

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Specification

1. Title of the Invention

Production of Foamed Decorative Material

2. Claim

Production of a foamed decorative material comprising the steps of:

laminating a synthetic resin layer containing a foaming agent onto a base material, applying repeated print patterns of coating containing a foam controlling agent or crosslinking agent on the synthetic resin layer, heating the resin layer into a foamed layer having recessed and protruding patterns, re-heating the foamed layer at a temperature equal to or lower than the foaming temperature in the previous step and embossing the foamed layer with a cold embossing roll to form sharp and embossed random patterns at the protruding surfaces thereof.

3. Detailed Description of the Invention

[Industrial Applications]

The present invention relates to the production of internal foamed decorative material with excellent designs having complex and highly stereoscopic embossed patterns by forming recessed patterns of repeat patterns on a foamed layer and also forming sharp embossed patterns at the protruding surfaces thereof.

[Prior Art]

As internal automotive trim and architectural trim have recently been required to be more luxurious, the demand for more complex patterns has gradually increased. As part of the solutions, requests have been made to develop highly decorative internal-decorative materials with complex and stereoscopic patterns by forming recessed parts of repeat patterns on a synthetic resin foamed material laminated on a base material and also by adding random sharp embossed patterns at the protruding parts thereof.

As for conventional productions of internal decorative materials having such patterns, the known methods are: (1) a so-called secondary embossing method of heating and foaming a synthetic resin layer containing a foaming agent, immediately forming random uneven embossed patterns with a cold embossing roll on the surface thereof, and then heating and adding recessed patterns with a cold embossing roll having repeat patterns thereto, or (2) a chemical embossing method of printing patterns corresponding to the above-noted recessed and protruding parts by applying coating material containing a foaming inhibitor or crosslinking agent on a synthetic resin layer containing a foaming agent, and then heating and foaming to form patterns corresponding to the embossed patterns mentioned above.

[Problems Overcome by the Invention]

However, in method (1) mentioned above, the primarily embossed patterns are deformed by heating during the secondary embossing process; also, the foamed layer mentioned above is heated twice due to the primary and secondary embossing, resulting in undesirable deformation and heat deterioration such as setting, cell deterioration, etc. of the foamed layer itself by the repeated heating.

Moreover, the method has various problems in that two expensive embossing rolls are needed and the method is costly and uneconomical, and the rolls should have a substantial pattern depth due to the above-noted reasons and it is difficult to add embossed patterns at a constant depth and shape.

Also, in method (2), the above-noted problems in method (1) may be avoided; however, it is difficult to permeate the inhibitor or crosslinking agent only to parts lower than the printed surface and the agent is likely to permeate around the periphery thereof, so that the patterns will have unclear unevenness, and temperature and time control will be difficult during the foaming process for forming the embossed patterns. As a result, the method has the problem in that it cannot form patterns with clear, significantly uneven and delicate patterns.

After extensive research to solve the above-mentioned conventional problems, the present invention presents a production of foamed decorative material having recessed parts of repeat patterns and also sharp and complex random patterns at the protruding surfaces noted above by combining both a chemical embossing method and a mechanical embossing method.

[Problem Resolution Means]

The present invention is the production of a foamed decorative material comprising the steps of: laminating a synthetic resin layer containing a foaming agent onto a base material, applying repeated print patterns of coating containing a foaming inhibitor or crosslinking agent on the synthetic resin layer, heating the resin layer into a foamed layer having recessed and protruding patterns, re-heating the foamed layer at a temperature equal to or lower than the foaming temperature in the previous step and embossing the foamed layer with a cold embossing roll to form sharp and embossed random patterns at the protruding surfaces thereof.

[Operation]

The production of the present invention is explained in detail below.

In the present invention, a synthetic resin layer containing a foaming agent is first formed on a base material. As the method thereof, the layer is laminated at a sheet thickness of 0.05mm to 0.3mm, or preferably 0.10mm to 0.25mm, at the decomposition temperature of the foaming agent thereof or below by any of a calendering method, a coating method and an extruding method.

This is because a sheet thickness less than 0.05mm is too thin when the sheet is heated to form a foamed layer and to add the above-mentioned embossed patterns, so that adding embossed patterns as the object of the invention may not be achieved. Also, if the sheet thickness is more than 0.25mm, the embossed patterns mentioned above will be satisfactorily formed but the sheet will be so heavy that there will be problems with application as internal decorative material.

Particularly, when the sheet is used as internal decorative material for walls, it cannot pass the

weight regulation under the anti-combustion standard applicable to such materials and the production cost will be high, which is not preferable.

Moreover, the above-noted base material used in the present invention is generally paper, paper used for internal automotive trim, fire retardant paper, knit, woven fabric, unwoven fabric, glass cloth, plastic sheet, etc. by itself or the laminate of at least two materials thereof. Also, synthetic resin used for the synthetic resin layer containing a foaming agent and laminated on the base material is, in addition to vinyl chloride homopolymer, copolymer of vinyl chloride and polyvinyl acetate, polyethylene, polyurethane, etc. or the blend of vinyl chloride homopolymer and the materials thereof; and a foaming agent that is an ordinary heat decomposable foaming agent such as azodicarbonamide, p,p'-oxybisbenzene sulphonyl hydrazide, azobisisobutyronitrile, etc. and plasticizer, stabilizer, lubricant, chelate, filler, coloring agent, etc. are mixed thereto. Then, the above-mentioned laminated sheet is formed with repeated printed patterns of a colored or uncolored coating material containing a foaming inhibitor or crosslinking agent on its surface. As the printed patterns mentioned above, any patterns may be used as long as they are repeated patterns, and highly decorative patterns such as checked patterns, flower patterns, and geometrical patterns may be optionally selected.

As the resin used for the coating material, vinyl chloride, or copolymer of vinyl chloride and vinyl acetate, acrylic resin, polyurethane, cellulose acetate, etc. are used. As solvent, ketone such as methyl ethyl ketone, cyclohexanone, methyl isobutyl ketone, etc., aromatic hydrocarbon such as xylene and toluene, chlorinated hydrocarbon such as ethylene dichloride, methylene chloride, etc. are appropriately chosen depending on the resin in use and are mixed thereto. If the coating material is coloring material, highly weather- and heat-resistant pigment is selected, adding the properties noted above and durability to products. As a foaming inhibitor mixed into the coating material, besotriazole, organic acid (e.g. maleic acid, fumaric acid, adipic acid), halogenated organic acid (e.g. gallophthaloyl (?) chloride, tetrachlorophthalic acid) or organic acid anhydride (e.g. maleic anhydride, trimellitic anhydride), etc. may be used; however, it is particularly

preferable to use benzotriazole or trimellitic anhydride. As a crosslinking agent mixed into the coating material, dithiol-S-triazine derivative (S-triazine derivative of, for example, 2-dibutylamino, 2-dimethylamino, 2-octylamino-, etc.) is applied, and 2-dibutylamino-S-triazine derivative is particularly preferable in the present invention. The mixed amount of the above-mentioned foaming inhibitor or crosslinking agent in the coating material is 2 wt. % to 30 wt. %, preferably 5 wt. % to 20 wt. %, relative to the total weight of the coating material. When the mixed amount of the foaming inhibitor or crosslinking agent is less than 2 wt. %, foam inhibiting or crosslinking effects during the foaming process of the laminated sheet layer will be incomplete at the printed pattern surfaces of the coating material and sufficiently recessed parts of repeat patterns, as the object of the present invention, cannot be formed. Also, when mixed at more than 30 wt. %, the above-mentioned foam inhibiting or crosslinking effects will not improve.

Moreover, in the present invention, a general coloring coating material of the above-noted composition with no mixture of the foaming inhibitor or crosslinking agent mentioned above is used to further apply different colored patterns from the above patterns on the laminated sheet, thus providing further complex and highly decorative products. The latter printed patterns may be formed after the formation of the foamed layer as the later process of the laminated sheet. As the method of forming the above printed patterns, the generally known gravure method, rotary screen printing method, flexographic method, or the like is used.

Continuously, after the layer is heated and dried at the temperature equal to or lower than the decomposition temperature of the foaming agent, the synthetic resin layer is heated and foamed in a heating furnace; at the same time, a coating material with the blend of a foaming inhibitor or crosslinking agent is used for suppressing the foaming of the printed patterns to form an embossed foamed layer having recessed repeat patterns.

In forming the layer, it is necessary to foam the foaming parts - in other words, protruding parts - by two to eight times. When the foaming is carried out by less than two times (0.1mm to 0.6mm in foamed sheet thickness), the foamed layer will be so thin that the above-noted process of

forming recessed patterns of repeat patterns and the following process of forming randomly embossed uneven patterns at the protruding surfaces of the foamed layer with a cold embossing roll cannot form sharp and stereoscopic patterns, which is not preferable.

Then, after uneven patterns of repeat patterns are added to the above-noted foamed layer by a chemical embossing method, the layer is re-heated at a temperature equal to or lower than the foaming temperature (lower than the decomposition temperature of the foaming agent therein) and a cold embossing roll having uneven patterns is used so as to form random sharp uneven patterns at protruding parts of the uneven patterns mentioned above.

In this case, it is preferable to use a roll having about 0.8mm to 2.0mm in depth of unevenness for the layer foamed almost eight times and the roll having 0.3mm to 0.8mm in depth of unevenness for the layer which is lightly foamed about two times so as to add patterns by a clearance embossing method. This is because random sharp and stereoscopic uneven patterns should be added without crushing the foamed cell structures at the protruding parts of the above-noted foamed layer with pressure. Moreover, in the present invention, if necessary, a surface treated layer is formed on the above-noted foamed layer before or after the foaming process by using a finishing agent consisting of generally known polyvinyl chloride resins, acrylic resins, urethane resins or others alone, or the copolymer thereof, or the blend thereof. By doing so, effects such as anti-contamination and matting may be added.

[Examples]

FIG. 1 shows a condition of one example of the present invention before foaming where a synthetic resin layer 2 containing a foaming agent is laminated on a base material 1 and colored or uncolored printed patterns 3 of repeat patterns containing a foam inhibitor or crosslinking agent is then formed on the layer surface.

Sequentially, a foamed layer 2' having uneven patterns of repeat patterns is formed by a so-called chemical embossing method wherein the synthetic resin layer 2 containing the above-noted foaming agent is heated and foamed, the foaming of printed patterns 3 is suppressed to form the recessed parts 6 of repeat patterns as shown in FIG. 2, and parts 5 having no printed patterns of repeat patterns are foamed to bring the same to protruding parts. Continuously, the foamed layer is re-heated at a temperature equal to or lower than the foaming temperature (decomposition temperature of the foaming agent therein) in the previous process, and sharp random uneven patterns 5' as shown in FIG. 3 are formed at the above-noted protruding parts 5 by a clearance embossing method with a cold embossing roll carved with random uneven patterns thereon. Moreover, in the present invention, a general printing coating material may be used before the above-noted foaming process or before an embossing process after the foaming process to add the printed patterns 4 at the protruding surfaces 5 of repeated uneven patterns of the synthetic resin layer 2 or the foaming layer 2' mentioned above, thus providing products with enhanced designs. Also, although not shown in each figure, an anti-contamination and matting effects may be also added to the present invention by forming a generally known surface treated layer on the synthetic resin foamed layer depending on the situation.

[Example 1]

A tile-like foamed material having recessed and colored checked patterns was provided by the steps of: over combustion paper for wall paper lining (WK-70NTP manufactured by Kojin Co., Ltd., coating a coating material of the blend A mentioned below, containing a foaming agent, at a thickness of about 0.2mm by a comma coater; then, heating it for about two minutes at about 140°C, which is lower than the decomposition temperature of the above foaming agent in a hot-air drying furnace, thus drying it into a gel condition and forming a colored synthetic resin layer containing the foaming agent; over the surface thereof, applying coloring ink containing a foaming inhibitor of the blending B mentioned below to add printed patterns of checked repeat patterns by a gravure method and then drying with hot air for about 40 seconds at about 110° C; by using

general gravure ink, similarly adding checked patterns of different repeat patterns from the above-noted printed patterns by a gravure method and drying as the above-mentioned printed patterns; and then, heating for about 60 seconds at about 220° C in a foaming furnace, thus decomposing the foaming agent therein and foaming the above synthetic resin layer, and at the same time, suppressing the foaming of the printed surfaces containing the above-noted foaming inhibitor. Sequentially, the surface of the foamed material was re-heated at the temperature equal to or lower than the above-noted foaming temperature by a far infrared radiation heater, and the protruding surfaces of the tile-like foamed material mentioned above were embossed by a clearance embossing method with a cold embossing roll carved with grain-like random patterns at about 1.5mm deep, thereby providing a foamed decorative material for building materials of an excellent design with the combination of recessed patterns of checked repeat patterns and grain-like sharp random uneven patterns at the protruding surfaces, and which is also clearly stereoscopic.

Blend A

Vinyl chloride resin (P = 900 paste resin)

	100wt. %
DOP	50wt. %
TCP	15wt. %
Ba-Zn stabilizer	3wt. %
Foaming agent (ADCA)	6wt. %
Filler (CaCO ₃)	50wt. %
Titanium pigment	15wt. %

Blend B.

Vinyl chloride-vinyl acetate copolymer resin

	20wt. %
Methyl ethyl ketone	90wt. %
Methyl isobutyl ketone	30wt. %
Mellitic anhydride (foaming inhibitor)	30wt. %
Red iron oxide pigment	10wt. %
Titanium yellow pigment	30wt. %
Carbon black	2wt. %

(Example 2)

An embossed foamed material having 0.9mm thick protruding surfaces of patterns and about 0.4mm thick recessed surfaces, was provided by the steps of: forming a jointing layer by coating a (illegible -shimohiki?) coating material used for general vinyl chloride laser on a polyester unwoven cloth of 90g/m² METSUKU as a base material; laminating a composite containing a foaming agent containing the blend C shown below at about 0.18mm sheet thickness by a calendaring method; then, forming flower patterns of repeat patterns on the layer by using coloring ink containing a crosslinking agent of the blend D mentioned below in the same method as in Example 1; and heating for 90 seconds at about 210°C in a foaming furnace for foaming. Then, uneven patterns were added thereto with a cold embossing roll where random cloth-like patterns were engraved at the depth of about 0.8mm, by the same clearance embossing method as in Example 1, thus providing a foamed decorative material for automotive trim which has uneven flower patterns and the same clear uneven patterns as in Example 1 with cloth patterns at the protruding surfaces of the flower patterns.

Blend C

PVC (P = 1100 straight resin)

	100wt. %
DOP	45wt. %
TCP	15wt. %
Ba-Zn stabilizer	3wt. %
Foaming agent (ADCA)	3wt. %
Filler (CaCO ₃)	20wt. %
Titanium pigment	10wt. %

Blend D

Vinyl chloride-vinyl acetate copolymer resin

	20wt. %
Methyl ethyl ketone	120wt. %
Toluene	40wt. %
Triazine-thiol DB (manufactured by Sankyokasei Corp., crosslinking agent)	25wt. %
Red iron oxide	15wt. %
Titanium yellow pigment	25wt. %
Carbon black	2wt. %

[Effects]

As described above, in the present invention, a synthetic resin layer containing a foaming agent is laminated on a base material; uneven patterns of repeat patterns are formed on the layer in a so-called chemical embossing method by using a coating material containing a foam inhibitor or crosslinking agent; and sharp uneven patterns are formed at protruding surfaces by a so-called mechanical embossing method with an embossing roll carved with random patterns. Thus, not only can the present invention produce internal foamed decorative materials having highly stereoscopic and complex patterns with excellent designs, but also can produce the materials economically by optionally selecting various patterns of repeat patterns. Furthermore, the present invention can provide internal foamed decorative materials which have uneven and highly stereoscopic patterns with the combination of the above-noted patterns and a small number of the latter random patterns.

4. Brief Explanation of the Drawings

FIG. 1 is a cross-sectional view of an example of the present invention before foaming.

FIG. 2 is the cross-sectional view after the foaming.

FIG. 3 is the cross-sectional view of FIG. 2 added with embossed patterns.

1: base material; 2: synthetic resin layer before foaming; 2': foamed layer; 3: printed patterns containing a foaming agent or crosslinking agent; 4: printed patterns by a normal method; 5: protruding parts having no printed pattern of repeat patterns; 5': random embossed patterns; 6: recessed parts of repeat patterns.

Patent Applicant: Kyowa Leather KK
Agent: ICHIKAWA, Rikichi

Written Amendment (voluntary)

December 4, 1987 (Sho 62)

To: the Commissioner of the Japanese Patent Office, Kunio OGAWA

1. Disclosure of a Case

Japanese Patent Application Sho 62 (1987) - 267711

2. Title of the Invention

Production of Foamed Decorative Material

3. Party Requesting Amendment

Patent Applicant

Kyowa Leather KK

4. Agent

Katakura Building, 1-2, Kyobashi 3-chome, Chuo-ku, Tokyo

(6179) Patent Attorney: Rikichi ICHIKAWA

5. Objects of Amendment: "Claim" and "Detailed Description of the Invention" in the specification

6. Contents of Amendment

- (1) The "Claim" in the specification is amended as in "Attachment 1".
- (2) "Kurikae kanetsu" on line 11 on page 3 of the same specification is amended to "kurikaeshi kanetsu".
- (3) "Okoshi" on line 13 on page 3 of the same specification is amended to "okoshi".
- (4) "Kanetsushi" on the last line on page 5 of the same specification is amended to "kanetsushite".
- (5) "0.25mm" on line 3 on page 6 of the same specification is amended to "0.3mm".
- (6) "Methyl isobutyl ket, etc." on the last line on page 7 to line 1 on page 8 of the same specification is amended to "methyl isobutyl ketone".
- (7) "Besozotriazol" on line 8 to line 9 on page 8 of the same specification is amended to "benzotriazol".
- (8) The table of "Blend B" on page 16 of the same specification is amended as in "Attachment 2".

[Attachment 1]

Claim

Production of a foamed decorative material comprising the steps of:

laminating a synthetic resin layer containing a foaming agent onto a base material, applying repeated print patterns of coating containing a foaming inhibitor or crosslinking agent on the synthetic resin layer, heating the resin layer into a foamed layer having recessed and protruding patterns, re-heating the foamed layer at a temperature equal to or lower than the foaming temperature in the previous step and embossing the foamed layer with a cold embossing roll to form sharp and embossed random patterns at the protruding surfaces thereof.

[Attachment 2]

Blend B

Vinyl chloride-vinyl acetate copolymer resin

	20wt. %
Methyl ethyl ketone	90wt. %
Methyl isobutyl ketone	30wt. %
Trimellitic anhydride (foaming inhibitor)	30wt. %
Red iron oxide pigment	10wt. %
Titanium yellow pigment	30wt. %
Carbon black	2wt. %

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審査請求 未請求 発明の数 1 (全7頁)

⑮ 発明の名称 発泡装飾材の製造方法

⑯ 特 願 昭62-267711

⑰ 出 願 昭62(1987)10月23日

⑱ 発 明 者 沖 汐 行 雄 静岡県浜松市東町1876番地 共和レザー株式会社内
⑲ 出 願 人 共和レザー株式会社 静岡県浜松市東町1876番地
⑳ 代 理 人 弁理士 市川 理吉

明 細 書

1. 発明の名称

発泡装飾材の製造方法

2. 特許請求の範囲

基材上に発泡剤を含有した合成樹脂層を積層した後、該層表面に発泡制御剤もしくは架橋剤を混入した塗料を用いてリビート柄を有する印刷模様を施し、これを加熱発泡して凹凸模様を有する発泡層とし、次いで上記発泡層形成時の発泡温度以下の温度を用いて該層を再加熱し、続いて冷エンボスロールにより該層の上記凸模様の形成部分に更にシャープな形状の凹凸のランダム状模様を付形することを特徴とする発泡装飾材の製造方法。

3. 発明の詳細な説明

〔産業上の利用分野〕

本発明は発泡層表面にリビート柄を有する凹凸模様を施し更に該層の凸模様部にシャープな凹

凸模様を形成することにより複雑な立体感に富んだ凹凸模様を有する重厚性に優れた室内発泡装飾材の製造方法に関するものである。

〔従来の技術〕

近來車両用、建築用の内装材は高級志向性の高まりに伴い次第に複雑なパターン柄の要望が強くなり、その具現性の一環として、基材上に積層した合成樹脂発泡体の表面にリビートを有する柄模様を形成した凹部分と、該層凸部に更にランダム状のシャープな凹凸模様を付与することにより複雑で立体的な高重厚性の内装材の開発が要望されている。

従来かかるパターンを有する内装材を製造する方法としては(1)発泡剤を含有した合成樹脂層を加熱発泡し、その直後に該層表面に冷エンボスロールを用いてランダム状の凹凸模様を形成し次いでこれを加熱してリビート柄の冷凹模様により凹模様を付与するいわゆる二次

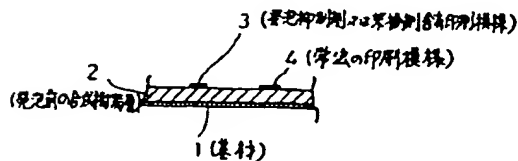
エンボスロールを用いるいわゆるメカニカルエンボス法によりシャープな凹凸模様を施すため、従来製造し得なかった顕著な立体感と複雑な高意匠性の内装用発泡装飾材の製造を可能とするばかりでなく、前記ケミカルエンボス法を用いることにより高価なエンボスロールを各柄に応じて製造する弊害を排除することが可能となり、リビートを有する多種多様の柄模様を任意に選択し安価に製造することができ、またさらに、該柄と後者の少数のランダム模様との組合せからなるパターンの模様によって極めて凹凸の立体感に富んだ高意匠性の発泡装飾用内装材を得ることができる。

4. 図面の簡単な説明

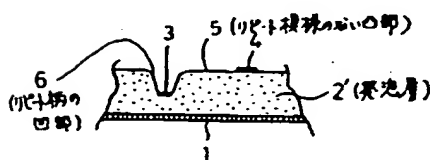
第1図は本発明の一実施例の発泡柄の断面図、第2図は、その発泡後の断面図、第3図は第2図にさらにエンボス模様を付形した断面図である。

- 19 -

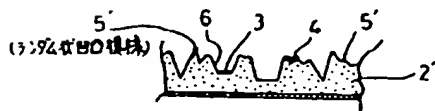
第1図



第2図



第3図



1: 基材、2: 発泡剤の合成樹脂層、2': 発泡層、3: 発泡剤の合成樹脂層又は架橋剤含有印刷模様、4: 常法の印刷模様、5: リビート模様の凹凸部、5': ランダム凹凸模様、6: リビート柄の凹部。

特許出願人

共和レザー株式会社

代理人

市川理吉

- 20 -

手続補正書 (自発)

昭和62年12月4日

特許庁長官 小川邦夫 殿

1 事件の表示

昭和62年特許願第267711号

2 発明の名称

発泡装飾材の製造方法

3 補正をする者

特許出願人

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4 代理人

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(1179) 弁理士 市川理吉

5 補正の対象

明細書中「特許請求の範囲」および「発明の詳細な説明」の各欄

6 補正の内容

(1) 明細書中「特許請求の範囲」を

